REMARKS

In the Action, claims 1-4 are rejected, and claim 5 is withdrawn from consideration as being directed to the non-elected invention. Applicants affirm the provisional election of process claims 1-4.

In view of the following comments, reconsideration and allowance are requested.

Rejection of Claims 1-4

Claims 1-4 are rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 3,988,509 to Ballard et al. in view of U.S. Patent No. 6,252,016 to Wu et al. Ballard et al. is cited for disclosing a process for producing ethylene copolymers by supplying a feed stream of ethylene and recycled unreacted monomers to a reactor. As noted in the Action, Ballard et al. does not disclose the use of premixing the monomers and initiator in a supply pipe to which the monomer liquid is continuously supplied to continuously stir the monomer in the supply pipe. Wu et al. is cited for disclosing a process for producing polymers from a monomer emulsion where the emulsion can be premixed to stabilize the emulsion before being fed to the reactor. Wu et al. does not disclose mixing the initiator with the emulsion prior to feeding to the reactor or feeding the initiator to the mixing apparatus for forming the stable emulsion. Therefore, it would not have been obvious to modify the process of Ballard et al. as suggested in the Action. The combination of Ballard et al. and Wu et al. do not suggest a polymerization process of feeding the monomer liquid to a supply pipe and continuously stirring the monomer liquid to form a turbulent flow of the monomer liquid and thereafter introducing an initiator into the turbulent flow of the monomer liquid to form a mixture of the monomer liquid and initiator which is then fed to the reactor.

The present invention is directed to a process of continuously supplying a monomer liquid to a supply pipe and continuously stirring the monomer liquid to form a turbulent flow of the monomer liquid. The initiator is then added to the turbulent flow of the monomer liquid to obtain a mixture of the monomer and initiator. An important feature of the invention is producing the turbulent flow of the monomer liquid in the flow pipe and thereafter introducing the initiator into the turbulent flow, thereby forming a substantially uniform mixture of the monomer and initiator without the need to pass the mixture through a separate mixing device. In the claimed invention, the flow of the monomer liquid is continuously stirred in advance of contacting with the initiator. The polymerization initiator is introduced into the turbulent flow of the monomer liquid while the monomer liquid being in a stirred state to continuously mix the monomer liquid and polymerization initiator. As noted above, Ballard et al. and Wu et al. do not disclose or suggest this feature. This feature of the claimed invention enables the polymerization to be carried out without clogging of the monomer supply pipe as often occurs in the prior processes. See, for example, the sentence bridging pages 3 and 4 of the specification. One cause of the clogging of the pipes of the prior process is the long-time mixing of the monomer liquid and initiator before feeding to the reactor.

In addition, as disclosed on page 17, lines 3-19, stirring the monomer liquid before the initiator is added enables a rapid and uniform mixing of the polymerization initiator into the monomer liquid. Thus, it is not necessary to provide a long pipe or long residence time in the pipe before feeding the mixture to the reactor as in the prior processes where components are fed through a common pipe without stirring before mixing. In addition, the stirring step of the monomer liquid and subsequent mixing step of the monomer liquid and initiator in the claimed invention inhibit the formation of polymer during the stirring and mixing steps which

typically occur in a conventional stirring apparatus. In the event that some polymerization occurs, the mixing of the claimed process prevents clogging of the pipe or the resulting polymer adhering to the pipe. These features are not recognized in the art of record.

As noted above, Wu et al. does not disclose or suggest stirring a monomer liquid and thereafter introducing an initiator to mix the initiator with the monomer liquid being in a stirred state. Therefore, even if one were to combine the teachings of Wu et al. with Ballard et al., the resulting combination would not be the claimed invention. The resulting process would still not stir the monomer liquid and thereafter introduce the initiator to mix the initiator with the monomer liquid being in a stirred state which is then fed to the reactor. Accordingly, it would not be obvious to one of ordinary skill in the art to modify the process of Ballard et al. to attain the claimed invention. Thus, claim 1 is not obvious over the combination of Ballard et al. and Wu et al.

Claims 2, 3 and 4 are also not obvious over the combination of Ballard et al. in view of Wu et al. as these claims recite additional features of the invention that are not disclosed or suggested in the cited art either alone or in combination with Ballard et al. and Wu et al. For example, claim 2 depends from claim 1 to recite that the monomer liquid has a concentration of not less than 40 weight%. The Action refers to column 26, lines 53-54, as allegedly disclosing monomers in the range of 30-50 weight%. However, there is no column 26 in the Ballard et al. patent. Furthermore, Applicants are unable to identify this disclosure in lines 53 and 54 of any column of the Ballard et al. patent. Applicants request clarification of this citation.

The Action may possibly refer to column 10, lines 38-40, as allegedly disclosing a monomer concentration of 30-50 weight%. However, this passage clearly does not disclose the monomer liquid having a concentration of 30-50 weight% as suggested in the Action. For

example, column 10, lines 37-40, in claim 9 of the Ballard et al. patent recites that "a sufficient amount of said vinyl ester, acrylate or methacrylate monomer is introduced to yield about 30-50 weight% of units derived from said monomer in the resulting copolymer". Thus, this passage clearly refers to the monomer content in the resulting copolymer and not the concentration of the monomer liquid. There is no relation between the concentration of the monomer liquid and the percent of a specific monomer in the resulting copolymer. Ballard et al. does not disclose or suggest a monomer liquid having a concentration of 30-50 weight% either expressly or inherently. Therefore, Ballard et al. does not disclose or suggest a monomer concentration in the monomer liquid having a concentration of "not less than 40 weight%" as recited in claim 2. Wu et al. also fails to disclose or suggest a monomer liquid having a concentration of not less than 40 weight%. Therefore, Wu et al. does not satisfy the deficiencies of Ballard et al.

The claimed monomer concentration of not less than 40 weight% as cited in claim 2 is an important aspect of the invention. For example, as noted on page 6, lines 7-10, of the specification, the improved features of the claimed process are attained where the monomer concentration is not less than 40 weight% so that the polymerization proceeds efficiently.

Claim 3 depends from claim 1 to recite that the monomer liquid has a temperature of not lower then 50 °C in the supply pipe. Thus, claim 3 recites the monomer liquid being at a temperature of not lower than 50 °C when being continuously stirred and when the polymerization initiator is introduced to the monomer liquid being in a stirred state. Ballard et al. and Wu et al. do not disclose or suggest the claimed temperature under these conditions.

The passages cited in the Action refer to the temperature range within the reactor of Ballard et al. Ballard et al. discloses that the monomer is maintained below the polymerization temperature during the feed process to prevent premature polymerization.

Thus, the monomer liquid of Ballard et al. when in the feed pipe is not at a temperature of not less than 50 °C as claimed. Furthermore, the initiator in the process of Ballard et al. is merged with the monomer just prior to feeding to the reactor. The monomer liquid and initiator of Ballard et al. are not heated to the desired polymerization temperature until fed to the reactor.

Furthermore, the flow of the monomer liquid in Ballard et al. is a conventional process where the polymerization initiator is not added to a stirred flow of the monomer liquid as in the claimed invention. Therefore, the monomer liquid and the polymerization initiator are not efficiently mixed in the feed pipe as in the claimed invention. Therefore, after the addition of the polymerization initiator to the monomer liquid, they need to be mixed together forcedly such as by a mixer to mix the component well. Therefore, if the monomer liquid of Ballard et al. was heated to the claimed temperature, the resulting mixture of the monomer liquid and initiator will result in clogging of the pipe and the polymer adhering to the inner surfaces of the pipe as noted on page 2, lines 2-11, of the present specification. The clogging of the pipe occurs as a result of the long-time mixing of the monomer liquid and initiator before the feeding to the reactor in the process of Ballard et al. In addition, even if the process of Ballard et al. is able to avoid the clogging of the pipe with the resulting polymer, the process of Ballard et al. supplies the monomer liquid to the polymerization apparatus immediately after introducing the polymerization initiator into the flow of the monomer liquid. This results in poor mixing of the monomer liquid and the polymerization initiator which results in a water-absorbent resin having inferior performance. Wu et al. also fails to disclose or suggest the claimed temperature in combination with the process steps of claim 1. Accordingly, it would not have been obvious to one of ordinary skill in the art to

provide the monomer liquid at the claimed temperature based on the Ballard et al. and Wu et al. references.

As noted above, the claimed invention recites that the polymerization initiator is added to the stirred flow of the monomer liquid. Therefore, the monomer liquid and the polymerization initiator are combined in a manner to efficiently and completely mix the initiator and monomer liquid. The combination of the polymerization initiator and the monomer liquid do not require subsequent mixing or forced mixing in a mixer as in the conventional processes such as in the processes as disclosed in Ballard et al. and Wu et al. The process of mixing the monomer liquid and initiator as in the claimed invention enables the monomer liquid to be maintained at a temperature of not lower than 50 °C as recited in claim 3 without the disadvantages of the prior process. The resulting mixture of the claimed invention can avoid the clogging and other problems caused by the forced mixing of the prior process. See, for example, page 17, lines 3-19 of the specification.

In other words, in the claimed invention, due to the above essential feature, the polymerization initiator can sufficiently be mixed into the monomer liquid in a short time without passing the monomer liquid and the polymerization initiator through such as a mixer after the addition of the polymerization initiator to the monomer liquid. Therefore, in the claimed invention, even if the monomer liquid has the comparatively high temperature recited in claim 3 at which the monomer easily polymerizes and, therefore, in order to avoid the clogging of the piping with the formed polymer, the mixture of the monomer liquid and the polymerization initiator is supplied to the polymerization apparatus immediately after introducing the polymerization initiator into a flow of the monomer liquid, then a water-absorbent resin having good performances can be obtained.

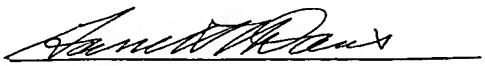
In view of the above, claim 3 would not have been obvious to one of ordinary skill in the art over Ballard et al. in view of Wu et al.

Claim 4 depends from claim 1 to recite that the monomer liquid is stirred to produce a Reynolds number not smaller than 50. The rejection appears to suggest that it would be obvious to modify Ballard et al. since Wu et al. is presumed to produce the claimed Reynolds number during the agitation. As noted above, Wu et al. discloses the agitation to produce an emulsion. There is no suggestion in Wu et al. of continuously stirring a monomer liquid and introducing an initiator into the monomer liquid to obtain a mixture as in the claimed invention. Since Ballard et al. is not intending to obtain an emulsion, Wu et al. provides no motivation or incentive to one of ordinary skill in the art to mix the monomer liquid and initiator according to the claimed process.

The passages referred to in the Action disclose the feed rate of the monomer emulsion and the speed of the agitator. These passages do not suggest the claimed Reynolds number of a monomer liquid as in the present invention. Even if the claimed Reynolds number occurs in the mixing of the emulsion of Wu et al., Wu et al. provides no motivation or incentive to modify Ballard et al. according to the claimed invention. Therefore, claim 4 in combination with the process steps of claim 1 would not be obvious over Ballard et al. in view of Wu et al.

In view of the above comments, reconsideration and allowance are requested.

Respectfully submitted,



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